Auditory-Visual Cross-Modal Perception

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ABSTRACT
The quality of realism in virtual environments is typically considered to be a function of visual and audio fidelity mutually exclusive of each other. However, the virtual environment participant, being human, is multi-modal by nature. Therefore, in order to more accurately validate the levels of auditory and visual fidelity required in a virtual environment, a better understanding is needed of the intersensory or cross-modal effects between the auditory and visual sense modalities.

To identify whether any pertinent auditory-visual cross-modal perception phenomena exist, 108 subjects participated in three experiments which are completely automated using HTML, Java, and JavaScript computer programming languages. Visual and auditory display quality perception are measured intramodally and intermodally by manipulating visual display pixel resolution and Gaussian white noise level and by manipulating auditory display sampling frequency and Gaussian white noise level.

Statistically significant results indicate that 1) high-quality auditory displays coupled with high-quality visual displays increase the quality perception of the visual displays relative to the evaluation of the visual display alone, and 2) low-quality auditory displays coupled with high-quality visual displays decrease the quality perception of the auditory displays relative to the evaluation of the auditory display alone. These findings strongly suggest that the quality of realism in virtual environments must be a function of both auditory and visual display fidelities inclusive of each other.

Keywords
Auditory displays, visual displays, auditory-visual displays, cross-modal, intersensory, low-quality, high-quality, fidelity

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REFERENCE
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